

LIS009443211B2

### (12) United States Patent

Friedlander et al.

(10) Patent No.: US 9,443,211 B2

(45) **Date of Patent: Sep. 13, 2016** 

(54) DESCRIBING A PARADIGMATIC MEMBER OF A TASK DIRECTED COMMUNITY IN A COMPLEX HETEROGENEOUS ENVIRONMENT BASED ON NON-LINEAR ATTRIBUTES

(75) Inventors: Robert R. Friedlander, Southbury, CT

(US); James R. Kraemer, Santa Fe,

NM (US)

(73) Assignee: International Business Machines

Corporation, Armonk, NY (US)

(\*) Notice: Subject to any disclaimer, the term of this

patent is extended or adjusted under 35

U.S.C. 154(b) by 1216 days.

(21) Appl. No.: 12/903,302

(22) Filed: Oct. 13, 2010

(65) Prior Publication Data

US 2012/0096020 A1 Apr. 19, 2012

(51) Int. Cl.

**G06F 17/30** (2006.01) **G06Q 10/06** (2012.01)

(52) U.S. Cl.

CPC ...... *G06Q 10/06311* (2013.01)

(58) Field of Classification Search

See application file for complete search history.

#### (56) References Cited

#### U.S. PATENT DOCUMENTS

4,890,227	A	12/1989	Watanabe et al
5,070,453	A	12/1991	Duffany
5,111,391	A	5/1992	Fields et al.

5,128,871	A	7/1992	Schmitz
5,148,365	Α	9/1992	Dembo
5,216,593	Α	6/1993	Dietrich et al.
5,764,740	A	6/1998	Holender
5,838,918	A	11/1998	Prager et al.
5,880,598	Α	3/1999	Duong
6,021,403	A	2/2000	Horvitz et al.
6,049,776	Α	4/2000	Donnelly et al.
6,076,166	A	6/2000	Moshfeghi et al.
6,102,856	A	8/2000	Groff et al.
6,164,975	Α	12/2000	Weingarden et al
6,212,524	B1	4/2001	Weissman et al.
6,272,483	В1	8/2001	Joslin et al.
6,289,340	В1	9/2001	Puram et al.
6,321,207	B1	11/2001	Ye
6,449,641	B1	9/2002	Moiin et al.
6,484,155	B1	11/2002	Kiss et al.
6,578,068	B1	6/2003	Bowman-Amuah
6,604,160	B1	8/2003	Le et al.
6,647,374	B2	11/2003	Kansal
		(C	4141

#### (Continued)

#### OTHER PUBLICATIONS

"Fraternity and Sorority Political Action Committee" as taken from www.facebook.com/fspac on May 19, 2013.\*

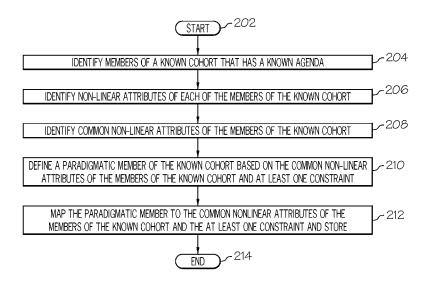
(Continued)

Primary Examiner — Angelica Ruiz (74) Attorney, Agent, or Firm — John R. Pivnichny; Law Office of Jim Boice

#### (57) ABSTRACT

A computer implemented method, system, and/or computer program product define a paradigmatic member of a known task directed community. Non-linear attributes of each member of the known task directed community having a known agenda are identified. Each of the non-linear attributes is individually unrelated to the known agenda. Common non-linear attributes shared by multiple members of the known task directed community are identified for use in defining the paradigmatic member of the known task directed community.

#### 20 Claims, 4 Drawing Sheets



# US 9,443,211 B2 Page 2

(56)	Referen	ices Cited		2006/0226991		10/2006	
IIS	PATENT	DOCUMENTS		2006/0294085 2007/0073654			Rose et al. Chow et al.
0.0	,. 12 <b>1</b> 1121 <b>1</b> 1	DOCOMENTS		2007/0073754	A1	3/2007	Friedlander et al.
6,675,159 B1		Lin et al.		2007/0073799 2007/0112735		3/2007 5/2007	Adjali et al. Holloway et al.
6,905,816 B2 6,937,147 B2	6/2005 8/2005	Jacobs et al. Dilbeck et al.		2007/0112733		6/2007	Bjornson
6,954,736 B2	10/2005	Menninger et al.		2007/0168307		7/2007	
7,181,428 B2 7,213,009 B2		Lawrence Pestotnik et al.		2007/0174090 2007/0174091			Friedlander et al. Friedlander et al.
7,215,009 B2 7,295,925 B2		Breed et al.		2007/0174101	A1	7/2007	Li et al.
7,343,316 B2		Goto et al.		2007/0179356 2007/0185737		8/2007 8/2007	Wessel Friedlander et al.
7,400,257 B2 7,403,922 B1	7/2008 7/2008	Rivas Lewis et al.		2007/0183737			Paris 715/745
7,457,764 B1	11/2008	Bullock et al.		2007/0203872			Flinn et al.
7,460,019 B2 7,464,147 B1		Henderson Fakhouri et al.		2007/0244701 2007/0274337		11/2007	Erlanger et al. Purpura
7,516,142 B2		Friedlander et al.		2008/0015871	Al	1/2008	Eder
7,523,118 B2		Friedlander et al.	505/05	2008/0028409 2008/0065576			Cherkasova et al. Friedlander et al.
7,526,442 B2 7,539,623 B1	* 4/2009 5/2009	Edgar et al Wyatt	705/35	2008/0077463			Friedlander et al.
7,558,745 B2	7/2009	Cullen et al.		2008/0082356			Friedlander et al.
7,584,160 B2 7,630,948 B2		Friedlander et al. Friedlander et al.		2008/0082374 2008/0147694			Kennis et al. Ernest et al.
7,630,986 B1		Herz et al.		2008/0155104	A1	6/2008	Quinn et al.
7,647,286 B2		Friedlander et al.		2008/0167929 2008/0172352		7/2008 7/2008	Cao et al. Friedlander et al.
7,647,288 B2 7,693,736 B1		Friedlander et al. Chu et al.		2008/0172332			Friedlander et al.
7,702,605 B2	4/2010	Friedlander et al.		2008/0177688			Friedlander et al.
7,739,606 B2 7,752,154 B2		Sawada et al. Friedlander et al.		2008/0189402 2008/0208801			Betzler et al. Friedlander et al.
7,732,134 B2 7,801,885 B1		Verma		2008/0208813	A1	8/2008	Friedlander et al.
7,930,262 B2		Friedlander et al.		2008/0208814 2008/0208832			Friedlander et al. Friedlander et al.
7,933,228 B2 8,001,008 B2	4/2011 8/2011			2008/0208838			Friedlander et al.
8,010,516 B2	8/2011	Ishii et al.		2008/0208875			Friedlander et al.
8,055,603 B2 8,204,779 B1	11/2011	Angell et al. Hughes et al.		2008/0208901 2008/0208902			Friedlander et al. Friedlander et al.
2001/0034632 A1		Wilkinson		2008/0208903	A1	8/2008	Friedlander et al.
2002/0019764 A1		Mascarenhas		2008/0208904 2008/0209493		8/2008	Friedlander et al. Choi et al.
2002/0052756 A1 2002/0059201 A1	5/2002 5/2002	Lomangino Work		2008/0209493		10/2008	Tsui et al.
2002/0107824 A1	8/2002	Ahmed et al.		2008/0281974		11/2008	Slothouber et al.
2002/0111922 A1 2002/0115447 A1	8/2002 8/2002	Young et al. Martin et al.		2008/0288862 2008/0294459		11/2008 11/2008	Smetters et al. Angell et al.
2002/0113447 A1 2002/0182573 A1	12/2002			2008/0294692	A1	11/2008	Angell et al.
2003/0033180 A1	2/2003			2009/0024553 2009/0106179		1/2009 4/2009	Angell et al. Friedlander et al.
2003/0065544 A1 2003/0088491 A1		Elzinga et al. Liu et al.		2009/0112670		4/2009	Black et al.
2003/0097291 A1		Freedman		2009/0138300 2009/0198733		5/2009	Kagan et al.
2003/0140063 A1 2003/0177038 A1	7/2003 9/2003	Pizzorno et al.		2009/0198733		8/2009 11/2009	Gounares et al. Angell et al.
2003/0220830 A1	11/2003			2009/0287674		11/2009	Bouillet et al.
2003/0220860 A1 2004/0006694 A1		Heytens et al. Heelan et al.		2009/0287683 2009/0299766		11/2009	Friedlander et al.
2004/0000094 A1 2004/0122787 A1	6/2004	Avinash et al.		2009/0299928	A1	12/2009	Kongtcheu
2004/0243422 A1	12/2004			2010/0010832 2010/0042456		1/2010 2/2010	Boute et al. Stinchcombe et al.
2004/0267595 A1 2005/0004823 A1		Woodings et al. Hnatio		2010/0042430			Soroca et al.
2005/0004828 A1	1/2005	DeSilva et al.		2010/0077438		3/2010	
2005/0038608 A1 2005/0080806 A1		Chandra et al. Doganata et al.		2010/0131028 2010/0191516			Hsu et al. Benish et al.
2005/0080800 A1 2005/0101873 A1		Misczynski et al.		2010/0223581	A1	9/2010	Manolescu et al.
2005/0144062 A1		Mittal et al.		2010/0228715 2011/0054968			Lawrence Galaviz
2005/0149466 A1 2005/0165594 A1		Hale et al. Chandra et al.		2011/0093287			Dicks et al.
2005/0198486 A1	9/2005	Desmond et al.		2011/0275907			Inciardi et al.
2005/0222989 A1 2005/0240668 A1		Haveliwala et al. Rolia et al.		2011/0301967 2012/0035971			Friedlander et al. Friedlander et al.
2006/0010090 A1		Brockway et al.		2012/0059815	Al	3/2012	Friedlander et al.
2006/0031110 A1	2/2006	Benbassat et al.		2012/0072460 2012/0096032			Friedlander et al. Brackett et al.
2006/0036560 A1 2006/0069514 A1	2/2006 3/2006	Fogel Chow et al.		2012/0090032			Bennett et al.
2006/0105830 A1	5/2006	Nemitz et al.				HER PU	BLICATIONS
2006/0155627 A1		Horowitz		IIS Appl No	12/903	376—No	on-Final Office Action Mailed Jul.
2006/0184412 A1 2006/0194186 A1		Kagan et al. Nanda	434/350	30, 2012.		.,570 -110	The field maner sul.
2006/0200435 A1	9/2006	Flinn et al.		U.S. Appl. No. 1	12/875	,261—No	tice of Allowance Mailed Sep. 27,
2006/0218010 A1	9/2006	Michon et al.		2012.			

#### (56) References Cited

#### OTHER PUBLICATIONS

Phillip E. Hayes et al., "Picking Up the Pieces: Utilizing Disaster Recovery Project Management to Improve Readiness and Response Time," IEEE Industry Applications Magazine, Nov./Dec. 2002, pp. 1-10 (Abstract).

Kun Wang et al., "A Mathematical Approach to Disaster Recovery Planning," Proceedings of the First International Conference on Semantics, Knowledge, and Grid, 2005, pp. 1-3 (Abstract).

E. A. Silver, "An Overview of Heuristic Solution Methods," The Journal of the Operational Research Society, vol. 55, No. 9, Sep. 2004, pp. 936-956 (Abstract).

Smith et al., "Collaborative Approaches to Research," HEFCE Fundamental Review of Research Policy and Planning, Final Report, Apr. 2000, pp. 1-117.

Report, Apr. 2000, pp. 1-117.

William E. Souder, "Analytical Effectiveness of Mathematical Models for R&D Project Selection," Management Science, vol. 19, No. 8, Application Seires, Apr. 1973, pp. 907-923 (Abstract).

J. Altmann et al., "Cooperative Software Development: Concepts, Model and Tools," Technology of Object-Oriented Languages and Systems, 1999, pp. 1-14.

Shou-Qi Cao et al., "Research on Resource Scheduling for Development Process of Complicated Product," Computer Supported Cooperative Work in Design, 2005. Proceedings of the Ninth International Conference On, vol. 1, pp. 229-233 (Abstract).

Ming Chen et al., "Research on Organization Method of Development Activities for Complicated Product," Computer Supported Cooperative Work in Design, 2005. Proceedings of the Ninth International Conference on, vol. 1, pp. 234-239 (Abstract).

Luckham et al., "Event Processing Glossary," Jul. 2008, pp. 1-19. http://complexevents.com.

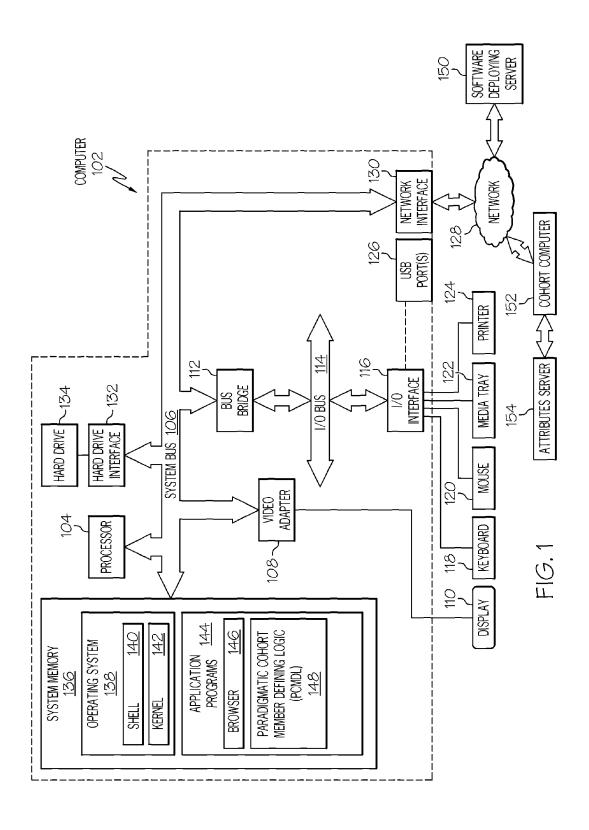
Dept of Health and Human Services Agency for Healthcare Research and Quality, "AHRQ Quality Indicators—Patient Safety Indicators—Technical Specifications," 2012, pp. 1-149. http://www.qualityindicators.ahrq.gov.

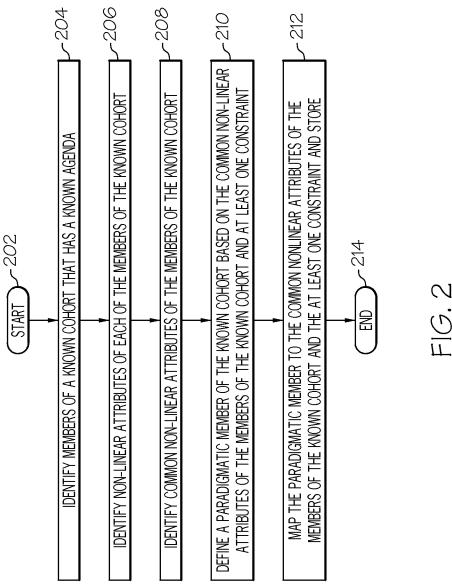
Wong et al., "Rule-Based Anomaly Pattern Detection for Detecting Disease Outbreaks," AAAI-02 Proceedings, 2002, pp. 1-7.

Grzymala-Busse, "Knowledge Acquisition Under Uncertainty—A Rough Set Approach," Journal of Intelligent and Robotic Systems, 1988 (Abstract).

Schadow et al., "Discussion Paper: Privacy-Preserving Distributed Queries for a Clinical Case Research Network," IEE International Conference on Data Mining Workshop on Privacy, Security, and Data Mining, 2002 (Abstract).

- T. Vercauteren et al., "Hierarchical Forecasting of Web Server Workload Using Sequential Monte Carlo Training", IEEE Transactions on Signal Processing, vol. 55, No. 4, pp. 1286-1297. Apr. 2007. (Abstract).
- P. Palazzari et al., "Synthesis of Pipelined Systems for the Contemporaneous Execution of Periodic and Aperiodic Tasks With Hard Real-Time Constraints", 18th International Parallel and Distributed Processing Symposium, 121. IEEE Comput. Soc, Los Alamitos, CA, USA, 2004, pp. LVI-239, (Abstract).
- RL Dillon et al., "Optimal Use of Budget Reserves to Minimize Technical and Management Failure Risks During Complex Project Development", IEEE Transactions on Engineering Management, vol. 52, No. 3, pp. 382-395, Aug. 2005. (Abstract).
- U.S. Appl. No. 12/851,995—Non-Final Office Action Mailed Apr. 25, 2012.
- U.S. Appl. No. 12/884,665—Non-Final Office Action Mailed Apr. 11, 2012.
- U.S. Appl. No. 12/875,261—Non-Final Office Action Mailed Feb. 14, 2012.
- K. Vanthournout et al., "A Taxonomy for Resource Discovery", Pers Ubiquit Comput 9, pp. 81-89, 2005.
- C. Srisuwanrat et al., "Optimal Scheduling of Probabilistic Repetitive Projects Using Completed Unit and Genetic Algorithms", Proceedings of the 2007 Winter Simulation Conference, pp. 2151-2158, 2007.
- S. Bharathi et al., "Scheduling Data-Intesive Workflows on Storage Constrained Resources", Works 09, Portland, OR, pp. 110 Nov. 15, 2009.
- J. Redondo et al., "Solving the Mulitple Competitive Facilities Location and Design Problem on the Plane", Massachusetts Institute of Technology, Evolutionary Computation, vol. 17, No. 1, pp. 21-53, 2009.
- H. Van et al., "Autonomic Virtual Resource Management for Service Hosting Platforms", Cloud'09, pp. 1-8, May 23, 2009. U.S. Appl. No. 12/884,665—Final Office Action Mailed Oct. 18,
- 2012. U.S. Appl. No. 12/795,847—Non-Final Office Action Mailed Nov.
- 26, 2012.U.S. Appl. No. 12/851,995—Final Office Action Mailed Nov. 8, 2012.
- U.S. Appl. No. 13/253,431—Non-Final Office Action Mailed Jan. 3, 2013.
- \* cited by examiner





NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE MEMBER IV NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE MEMBER III NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE Member II NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE Member I

FIG. 33

NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE MEMBER IV NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE MEMBER III NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE Member II NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE NON-LINEAR ATTRIBUTE MEMBER I

F16.4

#### DESCRIBING A PARADIGMATIC MEMBER OF A TASK DIRECTED COMMUNITY IN A COMPLEX HETEROGENEOUS ENVIRONMENT BASED ON NON-LINEAR ATTRIBUTES

#### BACKGROUND

The present disclosure relates to the field of computers, and specifically to the use of computers in allocating human resources. Still more particularly, the present disclosure relates to the use of computers in allocating human resources through the use of non-linear attributes of human resources. In one embodiment, the present disclosure operates within the environment of computerized databases.

#### **BRIEF SUMMARY**

A computer implemented method, system, and/or computer program product define a paradigmatic member of a 20 known task directed community. Non-linear attributes of each member of the known task directed community having a known agenda are identified. Each of the non-linear attributes is individually unrelated to the known agenda. Common non-linear attributes shared by multiple members of the known task directed community are identified for use in defining the paradigmatic member of the known task directed community.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 depicts an exemplary computer in which the present disclosure may be implemented;

FIG. 2 is a high level flow chart of one or more steps taken 35 by a processor to create and store a paradigmatic member of a known cohort; and

FIG. 3 and FIG. 4 illustrate exemplary sets of attributes for known members in a known cohort.

#### DETAILED DESCRIPTION

As will be appreciated by one skilled in the art, aspects of the present invention may be embodied as a system, method or computer program product. Accordingly, aspects of the 45 present invention may take the form of an entirely hardware embodiment, an entirely software embodiment (including firmware, resident software, micro-code, etc.) or an embodiment combining software and hardware aspects that may all generally be referred to herein as a "circuit," "module" or 50 "system." Furthermore, aspects of the present invention may take the form of a computer program product embodied in one or more computer readable medium(s) having computer readable program code embodied thereon.

Any combination of one or more computer readable 55 medium(s) may be utilized. The computer readable medium may be a computer readable signal medium or a computer readable storage medium. A computer readable storage medium may be, for example, but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, or device, or any suitable combination of the foregoing. More specific examples (a non-exhaustive list) of the computer readable storage medium would include the following: an electrical connection having one or more wires, a portable computer diskette, 65 a hard disk, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only

2

memory (EPROM or Flash memory), an optical fiber, a portable compact disc read-only memory (CD-ROM), an optical storage device, a magnetic storage device, or any suitable combination of the foregoing. In the context of this document, a computer readable storage medium may be any tangible medium that can contain, or store a program for use by or in connection with an instruction execution system, apparatus, or device.

A computer readable signal medium may include a propagated data signal with computer readable program code embodied therein, for example, in baseband or as part of a carrier wave. Such a propagated signal may take any of a variety of forms, including, but not limited to, electromagnetic, optical, or any suitable combination thereof. A computer readable signal medium may be any computer readable medium that is not a computer readable storage medium and that can communicate, propagate, or transport a program for use by or in connection with an instruction execution system, apparatus, or device.

Program code embodied on a computer readable medium may be transmitted using any appropriate medium, including, but not limited to, wireless, wireline, optical fiber cable, RF, etc., or any suitable combination of the foregoing.

Computer program code for carrying out operations for aspects of the present invention may be written in any combination of one or more programming languages, including an object oriented programming language such as Java, Smalltalk, C++ or the like and conventional procedural programming languages, such as the "C" programming 30 language or similar programming languages. The program code may execute entirely on the user's computer, partly on the user's computer, as a stand-alone software package, partly on the user's computer and partly on a remote computer or entirely on the remote computer or server. In the latter scenario, the remote computer may be connected to the user's computer through any type of network, including a local area network (LAN) or a wide area network (WAN), or the connection may be made to an external computer (for example, through the Internet using an Internet Service 40 Provider).

Aspects of the present invention are described below with reference to flowchart illustrations and/or block diagrams of methods, apparatus (systems) and computer program products according to embodiments of the invention. It will be understood that each block of the flowchart illustrations and/or block diagrams, and combinations of blocks in the flowchart illustrations and/or block diagrams, can be implemented by computer program instructions. These computer program instructions may be provided to a processor of a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, create means for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

These computer program instructions may also be stored in a computer readable medium that can direct a computer, other programmable data processing apparatus, or other devices to function in a particular manner, such that the instructions stored in the computer readable medium produce an article of manufacture including instructions which implement the function/act specified in the flowchart and/or block diagram block or blocks.

The computer program instructions may also be loaded onto a computer, other programmable data processing apparatus, or other devices to cause a series of operational steps

to be performed on the computer, other programmable apparatus or other devices to produce a computer implemented process such that the instructions which execute on the computer or other programmable apparatus provide processes for implementing the functions/acts specified in <sup>5</sup> the flowchart and/or block diagram block or blocks.

With reference now to the figures, and in particular to FIG. 1, there is depicted a block diagram of an exemplary computer 102, which may be utilized by the present invention. Note that some or all of the exemplary architecture, including both depicted hardware and software, shown for and within computer 102 may be utilized by software deploying server 150, cohort computer 152, and/or attributes server 154.

Computer 102 includes a processor 104 that is coupled to a system bus 106. Processor 104 may utilize one or more processors, each of which has one or more processor cores. A video adapter 108, which drives/supports a display 110, is also coupled to system bus 106. System bus 106 is coupled via a bus bridge 112 to an input/output (I/O) bus 114. An I/O interface 116 is coupled to I/O bus 114. I/O interface 116 affords communication with various I/O devices, including a keyboard 118, a mouse 120, a media tray 122 (which may include storage devices such as CD-ROM drives, multimedia interfaces, etc.), a printer 124, and external USB port(s) 126. While the format of the ports connected to I/O interface 116 may be any known to those skilled in the art of computer architecture, in one embodiment some or all of these ports are universal serial bus (USB) ports.

As depicted, computer 102 is able to communicate with a software deploying server 150 using a network interface 130. Network 128 may be an external network such as the Internet, or an internal network such as an Ethernet or a virtual private network (VPN).

A hard drive interface 132 is also coupled to system bus 106. Hard drive interface 132 interfaces with a hard drive 134. In one embodiment, hard drive 134 populates a system memory 136, which is also coupled to system bus 106. System memory is defined as a lowest level of volatile 40 memory in computer 102. This volatile memory includes additional higher levels of volatile memory (not shown), including, but not limited to, cache memory, registers and buffers. Data that populates system memory 136 includes computer 102's operating system (OS) 138 and application 45 programs 144.

OS 138 includes a shell 140, for providing transparent user access to resources such as application programs 144. Generally, shell 140 is a program that provides an interpreter and an interface between the user and the operating system. 50 More specifically, shell 140 executes commands that are entered into a command line user interface or from a file. Thus, shell 140, also called a command processor, is generally the highest level of the operating system software hierarchy and serves as a command interpreter. The shell 55 provides a system prompt, interprets commands entered by keyboard, mouse, or other user input media, and sends the interpreted command(s) to the appropriate lower levels of the operating system (e.g., a kernel 142) for processing. Note that while shell 140 is a text-based, line-oriented user 60 interface, the present invention will equally well support other user interface modes, such as graphical, voice, gestural, etc.

As depicted, OS 138 also includes kernel 142, which includes lower levels of functionality for OS 138, including 65 providing essential services required by other parts of OS 138 and application programs 144, including memory man-

4

agement, process and task management, disk management, and mouse and keyboard management.

Application programs 144 include a renderer, shown in exemplary manner as a browser 146. Browser 146 includes program modules and instructions enabling a world wide web (WWW) client (i.e., computer 102) to send and receive network messages to the Internet using hypertext transfer protocol (HTTP) messaging, thus enabling communication with software deploying server 150 and other computer systems.

Application programs 144 in computer 102's system memory (as well as software deploying server 150's system memory) also include a paradigmatic cohort member defining logic (PCMDL) 148. PCMDL 148 includes code for implementing the processes described below, including those described in FIGS. 2-4. In one embodiment, computer 102 is able to download PCMDL 148 from software deploying server 150, including in an on-demand basis, wherein the code in PCMDL 148 is not downloaded until needed for execution to define and/or implement the improved enterprise architecture described herein. Note further that, in one embodiment of the present invention, software deploying server 150 performs all of the functions associated with the present invention (including execution of PCMDL 148), thus freeing computer 102 from having to use its own internal computing resources to execute PCMDL 148.

The hardware elements depicted in computer 102 are not intended to be exhaustive, but rather are representative to highlight essential components required by the present invention. For instance, computer 102 may include alternate memory storage devices such as magnetic cassettes, digital versatile disks (DVDs), Bernoulli cartridges, and the like. These and other variations are intended to be within the spirit and scope of the present invention.

Referring now to FIG. 2, a high level flow chart of one or more steps taken by a processor to create and store a paradigmatic member of a known cohort is presented. After initiator block 202, members of a known cohort, which has a known agenda, are identified (block 204). One example of a cohort, including a known cohort, is a task directed community, such as a political action group, a community services group, a social club, etc. Their known agenda may be deduced from the cohort's mission statement, press releases, affiliation with other organizations, websites, publications, contributions, conferences, etc. For example, assume that the known cohort (task directed community) is a highway beautification club that is dedicated to picking up garbage from public highways. The members can be identified by a membership roster of the club. If the club is more loosely organized, then members can be identified by mass e-mailings from a leader of the club, mailing lists, webposted sign-in sheets to meetings, etc.

As described in block **206**, non-obvious or even unrelated attributes (i.e., non-linear attributes) of each member of the cohort are identified and supplied by a computer, such as cohort computer **152** shown in FIG. **1**, as received from an attribute source, such as attributes server **154**. The non-linear attributes may be marked/identified by marking a field in a database that is used to store information about members of the cohort. The non-linear attributes are defined as attributes that are each, individually, logically unrelated to the known agenda of the cohort. For example, assume that a member of the highway beautification club has the following attributes: 1) a college degree; 2) a subscription to a national newspaper; 3) at least one dependant; and 4) an annual income of less than \$40,000/year. There is no logical nexus between any or all of these attributes and the fact that

this person is a member of a cohort devoted to highway beautification. Nonetheless, if one or more non-linear attributes are shared by members of the known cohort (block 208), then a paradigmatic member can be defined based on these non-linear attributes and at least one constraint (block 210). This paradigmatic member is defined as a modeled person that has an interest/capacity/ability to be a participating member of that known cohort (or a similar cohort having a similar agenda/constraints), subject to a specific combination of non-linear attributes and at least one constraint

The constraint is a requirement of the cohort itself. Exemplary constraints are that members live within a predefined geographical area (i.e., within a predetermined radius of a meeting location of the cohort), that each member has some predetermined license/credential necessary for participating in the activities of the cohort, that the members are all over a certain age, etc. Thus, once a candidate paradigmatic member is defined based on his/her non-linear attributes (which are unrelated to the agenda of the cohort), then this candidate paradigmatic member may be further filtered out based on the linear constraints of the cohort itself.

In order to determine what describes a paradigmatic <sup>25</sup> member from known members of the cohort, in one embodiment a Bayesian analysis is used. This Bayesian analysis assumes that a new candidate member for either the known cohort or a new (but similar) cohort is being considered for membership. For example, assume that A represents the event that a candidate being considered will be a good member of a new cohort that is similar to a known cohort, and B represents the event that the candidate has the same attributes as a paradigmatic member of the known cohort.

This results in the Bayesian probability formula of:

$$P(A \mid B) = \frac{P(B \mid A) * P(A)}{P(B)}$$

where:

P(A|B) is the probability that a candidate person will be a good member of a similar cohort (A) given that (I) the new person has the same attributes as the paradigmatic <sup>45</sup> member (B);

P(B|A) is the probability that a known member of the known cohort has the same attributes as the paradigmatic member:

P(A) is probability that the candidate person will be a good member of the similar cohort regardless of any other information; and

P(B) is the probability that the new person will have the same attributes as the paradigmatic member regardless of any other information.

For example, assume that three out of four members (Members I-IV) of the known cohort had the same attributes as a paradigmatic member that has been defined as holding Attributes  $\bf 2$ - $\bf 3$ , as shown in section  $\bf 302$  of Table  $\bf 300$  shown 60 in FIG.  $\bf 3$ . Thus,  $\bf P(B|A)=3$  out of  $\bf 4=0.75$ . Assume also that the odds that the new person will be a good member of the known or a similar cohort regardless of any other information (P(A)) is 0.10, and that the probability that the new person will have the same attributes (Attributes  $\bf 1$  and  $\bf 2$ ) as 65 the paradigmatic member regardless of any other information (P(B)) is 0.12. The probability that a candidate person

6

will be a good member of the similar cohort given that the candidate person has the same attributes as the paradigmatic member is 62%:

$$P(A \mid B) = \frac{.75 * .10}{.12} = .62$$

However, if all four members of the known cohort held the same attributes as the paradigmatic member (P(B|A) =1.0), as shown in section **402** of Table **400** shown in FIG. **4**, then the probability that a candidate person will be a good member of the similar cohort, given that the candidate person has the same attributes as the paradigmatic member, is now 83%:

$$P(A \mid B) = \frac{1.0 * .10}{.12} = .83$$

Thus, shared non-linear attributes among more members increase the accuracy of describing a paradigmatic member. Similarly, an increase in the number of shared attributes among members also increases the accuracy of describing a paradigmatic member (P(A|B)), since members of the known cohort sharing more attributes causes the probability that a candidate person (for the known cohort or a similar cohort) will have the same attributes as the paradigmatic member regardless of any other information (P(B)) to decrease. Therefore, in one embodiment, a minimum number of common non-linear attributes for members of the known cohort are defined, such that the definition of the paradigmatic member is limited to a person holding at least the defined minimum number of common non-linear attributes.

Returning to FIG. 2, once the paradigmatic member is defined, this paradigmatic member is mapped to the common non-linear attributes of members of the known cohort and the constraint of the cohort, and is stored for future use (block 212). In one embodiment, this mapping includes adding a tag to the entry for the paradigmatic member for ease of future retrieval. For example, assume that, based on the known agenda and constraints on the known cohort, members of the known cohort hold a individual interest in public beautification (which is pre-defined as including painting building murals, planting trees in public spaces, picking up garbage from public spaces and roadways, working to restrict billboard locations, etc.). A tag, such as a descriptor text, is added to the entry for the paradigmatic member. An exemplary tag/descriptor text may be "public beautification." Thus, when another cohort, which is devoted to public beautification in any of the exemplary embodiments just described, is searching for new members, that other cohort may search for the tag "public beautification" to locate the appropriate paradigmatic member model. The process ends at terminator block 214.

The flowchart and block diagrams in the figures illustrate the architecture, functionality, and operation of possible implementations of systems, methods and computer program products according to various embodiments of the present disclosure. In this regard, each block in the flowchart or block diagrams may represent a module, segment, or portion of code, which comprises one or more executable instructions for implementing the specified logical function (s). It should also be noted that, in some alternative implementations, the functions noted in the block may occur out

7

of the order noted in the figures. For example, two blocks shown in succession may, in fact, be executed substantially concurrently, or the blocks may sometimes be executed in the reverse order, depending upon the functionality involved. It will also be noted that each block of the block 5 diagrams and/or flowchart illustration, and combinations of blocks in the block diagrams and/or flowchart illustration, can be implemented by special purpose hardware-based systems that perform the specified functions or acts, or combinations of special purpose hardware and computer 10 instructions.

The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms 15 as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence 20 or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

The corresponding structures, materials, acts, and equivalents of all means or step plus function elements in the claims below are intended to include any structure, material, 25 or act for performing the function in combination with other claimed elements as specifically claimed. The description of various embodiments of the present invention has been presented for purposes of illustration and description, but is not intended to be exhaustive or limited to the invention in 30 the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art without departing from the scope and spirit of the invention. The embodiment was chosen and described in order to best explain the principles of the invention and the practical 35 application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.

Note further that any methods described in the present disclosure may be implemented through the use of a VHDL (VHSIC Hardware Description Language) program and a VHDL chip. VHDL is an exemplary design-entry language for Field Programmable Gate Arrays (FPGAs), Application Specific Integrated Circuits (ASICs), and other similar electronic devices. Thus, any software-implemented method described herein may be emulated by a hardware-based VHDL program, which is then applied to a VHDL chip, such as a FPGA.

Having thus described embodiments of the invention of 50 the present application in detail and by reference to illustrative embodiments thereof, it will be apparent that modifications and variations are possible without departing from the scope of the invention defined in the appended claims.

What is claimed is:

- 1. A computer implemented method of defining a paradigmatic member of a task directed community, the computer implemented method comprising:
  - a processor marking non-linear attributes of each member of a known cohort by marking fields associated with the non-linear attributes in a database used to store information about members of the known cohort, wherein the known cohort is a task directed community that has a known agenda, wherein each of the non-linear attributes is individually unrelated to the known agenda, and wherein there is no logical nexus between any of

8

- the non-linear attributes and a particular person's membership in the known cohort;
- the processor utilizing marked fields in the database to identify common non-linear attributes that are shared by multiple members of the known cohort;
- the processor defining a paradigmatic member of the known cohort based on the common non-linear attributes of the members of the known cohort and at least one constraint on the known cohort; and
- the processor mapping the paradigmatic member of the known cohort to the common non-linear attributes of the members of the known cohort and said at least one constraint on the known cohort for storage of same.
- 2. The computer implemented method of claim 1, further to comprising:
  - the processor identifying a political action group as the task directed community.
  - 3. The computer implemented method of claim 1, further comprising:
    - the processor deducing the known agenda of the task directed community from a mission statement of the task directed community, press releases issued by the task directed community, an affiliation between the task directed community and other organizations, a website of the task directed community, and conferences produced by the task directed community.
  - **4**. The computer implemented method of claim **1**, further comprising:
    - the processor defining a minimum number of common non-linear attributes for members of the known cohort;
    - the processor limiting a definition of the paradigmatic member to a person holding at least the defined minimum number of common non-linear attributes.
  - **5**. The computer implemented method of claim **4**, wherein the minimum number of common non-linear attributes is less than all attributes of members of the known cohort.
  - **6**. The computer implemented method of claim **1**, further comprising:
    - the processor defining said at least one constraint as a requirement that a member of the known cohort be a member of an organization that is devoted to the known agenda of the known cohort.
  - 7. The computer implemented method of claim 1, further comprising:
    - the processor assigning a descriptor text to the paradigmatic member, wherein the descriptor text describes an area of individual interest held by the paradigmatic member.
  - **8**. A computer program product for defining a paradigmatic member of a task directed community, the computer program product comprising:
    - a non-transitory computer readable storage media;
    - first program instructions to identify non-linear attributes of each member of a known cohort, wherein the known cohort is a task directed community that has a known agenda, and wherein each of the non-linear attributes is individually unrelated to the known agenda;
    - second program instructions to identify common nonlinear attributes that are shared by multiple members of the known cohort;
    - third program instructions to define a paradigmatic member of the known cohort based on the common nonlinear attributes of the members of the known cohort and at least one constraint on the known cohort; and
    - fourth program instructions to map the paradigmatic member of the known cohort to the common non-linear

attributes of the members of the known cohort and said at least one constraint on the known cohort for storage of same; and wherein the first, second, third, and fourth program instructions are stored on the non-transitory computer readable storage media.

9. The computer program product of claim 8, further

fifth program instructions to retrieve the non-linear attributes of the members of the known cohort from a public database; and wherein

the fifth program instructions are stored on the non-transitory computer readable storage media.

10. The computer program product of claim 8, further comprising:

fifth program instructions to define a minimum number of 15 common non-linear attributes for members of the known cohort; and

sixth program instructions to limit a definition of the paradigmatic member to a person holding at least the defined minimum number of common non-linear attri- 20 the fifth program instructions are stored on the computer butes; and wherein

the fifth and sixth program instructions are stored on the non-transitory computer readable storage media.

- 11. The computer program product of claim 10, wherein the minimum number of common non-linear attributes is 25 less than all attributes of members of the known cohort.
- 12. The computer program product of claim 8, further comprising:

fifth program instructions to define said at least one constraint as a requirement that a member of the known  $\,^{30}$ cohort reside within a predetermined distance from a meeting place for the known cohort; and wherein

the fifth program instructions are stored on the non-transitory computer readable storage media.

13. The computer program product of claim 8, further 35 comprising:

fifth program instructions to define said at least one constraint as being a requirement that a member of the known cohort is a member of an organization that is wherein

the fifth program instructions are stored on the non-transitory computer readable storage media.

14. The computer program product of claim 8, further comprising:

fifth program instructions to assign a descriptor text to the paradigmatic member, wherein the descriptor text describes an area of individual interest held by the paradigmatic member; and wherein

the fifth program instructions are stored on the non-transi- 50 tory computer readable storage media.

15. A computer system comprising:

a central processing unit (CPU), a computer readable memory, and a computer readable storage media;

first program instructions to identify non-linear attributes 55 of each member of a known cohort, wherein the known cohort is a task directed community that has a known agenda, and wherein each of the non-linear attributes is individually unrelated to the known agenda;

10

second program instructions to identify common nonlinear attributes that are shared by multiple members of the known cohort;

third program instructions to define a paradigmatic member of the known cohort based on the common nonlinear attributes of the members of the known cohort and at least one constraint on the known cohort; and

fourth program instructions to map the paradigmatic member of the known cohort to the common non-linear attributes of the members of the known cohort and said at least one constraint on the known cohort for storage of same; and wherein

the first, second, third, and fourth program instructions are stored on the computer readable storage media for execution by the CPU via the computer readable memory.

16. The computer system of claim 15, further comprising: fifth program instructions to retrieve the non-linear attributes of the members of the known cohort from a public database; and wherein

readable storage media for execution by the CPU via the computer readable memory.

17. The computer system of claim 15, further comprising: fifth program instructions to define a minimum number of common non-linear attributes for members of the known cohort; and

sixth program instructions to limit a definition of the paradigmatic member to a person holding at least the defined minimum number of common non-linear attributes; and wherein

the fifth and sixth program instructions are stored on the computer readable storage media for execution by the CPU via the computer readable memory.

18. The computer system of claim 15, further comprising; fifth program instructions to define said at least one constraint as a requirement that a member of the known cohort reside within a predetermined distance from a meeting place for the known cohort; and wherein

the fifth program instructions are stored on the computer devoted to the known agenda of the known cohort; and 40 readable storage media for execution by the CPU via the computer readable memory.

19. The computer system of claim 15, further comprising: fifth program instructions to define said at least one constraint as being a requirement that a member of the known cohort is a member of an organization that is devoted to the known agenda of the known cohort; and wherein

the fifth program instructions are stored on the computer readable storage media for execution by the CPU via the computer readable memory.

20. The computer system of claim 15, further comprising: fifth program instructions to assign a descriptor text to the paradigmatic member, wherein the descriptor text describes an area of individual interest held by the paradiginatic member; and wherein

the fifth program instructions are stored on the computer readable storage media for execution by the CPU via the computer readable memory.